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(54) **A METHOD FOR THE FLAT MANUFACTURE OF THREE-DIMENSIONAL ARTICLES,  
PARTICULARLY ABSORBANT, DISPOSABLE ARTICLES, AND AN ARTICLE PRODUCED IN  
ACCORDANCE WITH THE METHOD**

VERFAHREN ZUR EBENEN HERSTELLUNG VON DREIDIMENSIONALEN ARTIKELN,  
INSBESONDERE VON SAUGFÄHIGEN WEGWERFARTIKELN SOWIE MIT DEM VERFAHREN  
HERGESTELLTE ARTIKEL

PROCEDE DE FABRICATION A PLAT D'ARTICLES TRIDIMENSIONNELS, EN PARTICULIER  
D'ARTICLES ABSORBANTS JETABLES ET ARTICLE PRODUIT SELON CE PROCEDE

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**EP 0 591 159 B1**

## Description

The present invention relates to a method for the flat manufacture of three-dimensional articles, in particular absorbent disposable articles, and to an article produced in accordance with the method.

Absorbent disposable articles, such as diapers, incontinence guards and sanitary napkins, often consist of a substantially flat absorbent pad enclosed between an outer, liquid-impermeable casing layer and an inner, liquid-permeable casing layer. Such articles are mass produced, by placing absorbent pads on a moving web of material and placing a further web of material on the first mentioned web and fastening the two material webs together in regions thereof which protrude beyond the absorbent pads, whereafter a finished article is cut from the thus formed composite web. In the case of the present document, this article is considered to be flat. The human bodies on which such articles are worn, however, are anything but flat and consequently when the article is put on, the absorbent pad will deform and form folds and pleats in the article. Furthermore, it is difficult to shape such articles so that they conform to the shape of the user's body when worn. These factors contribute to an impaired function of the article, particularly with respect to leakage reliability.

If this deformation and folding of absorbent, disposable articles could be eliminated or reduced and/or controlled, the risk of leakage with such articles would be reduced to a significant extent. A large number of different constructions are known whose primary purpose is to avoid the formation of folds in sensitive regions of the article, for instance at the margins or edges of the crotch region of the article, or to provide controlled deformation of the article, for instance so that raised embankments or flaps are formed along the edge margins of the crotch part of the article. It is also known to provide such articles with patterns of pre-tensioned elastic threads or bands; so as to impart a basin-like shape to the article or parts thereof.

The object of the present invention is to solve the aforesaid problems encountered with absorbent, disposable articles, by providing an article which can be manufactured in a flat state and which, subsequent to manufacture, will assume a three-dimensional shape corresponding to the shape of the user's body.

To this end, there is proposed in accordance with the invention a method of the aforesaid kind which is characterized by placing a plurality of flat, flexible pads intended to form the three-dimensional article sequentially on a flat support surface, such that the side surfaces of at least some mutually adjacent pads will diverge from one another over at least certain sections of the bodies, and by mutually joining the side surfaces of said pads with the aid of pre-stretched contractable devices, and by subsequently permitting the devices to contract so as to convert the article from a flat state to a three-dimensional shape.

The invention also relates to an absorbent, disposable article, such as a diaper, an incontinence guard or a sanitary napkin, manufactured in accordance with said method and comprising an absorbent pad or body enclosed between an inner and an outer casing layer. The inventive article is characterized in that the absorbent body is constructed from a plurality of elongated narrow bodies, each of which is enclosed between two casing layers which are mutually joined along parts lying externally of said bodies; and in that the side surfaces of said bodies are joined, or substantially joined, to the side surfaces of adjacent bodies at least in those parts which lie outside the crotch region of the article; and in that the article has a three-dimensional shape.

So that the invention will be more readily understood and further features thereof made apparent, the invention will now be described in more detail with reference to an exemplifying embodiment thereof illustrated in the accompanying drawings, in which

Figure 1 illustrates one stage in the inventive manufacture of a first embodiment of an inventive diaper;

Figure 2 shows the diaper of Figure 1 when manufacture is completed; and

Figure 3 illustrates the same step as that in Figure 1 in the manufacture of a diaper according to another embodiment of the invention.

Figure 1 illustrates the step in the manufacture of an inventive diaper prior to applying a liquid-permeable casing layer. As shown in the Figure, the absorbent pad of the diaper is comprised of a number of elongated, narrow flat bodies  $1_a-1_g$  made of an absorbent material, for instance cellulose fluff, which may be admixed with so-called superabsorbents and/or melt fibres. In the case of the Figure 1 embodiment, the bodies  $1_a-1_g$  have been placed, in a first manufacturing step, on a web of liquid-impermeable material 2 in the pattern illustrated in Figure 1, said liquid-impermeable material forming an outer casing layer or backing sheet of the finished article. A plurality of transverse, stretched elastic threads 3 have then been placed on the bodies  $1_a-1_g$  in a second manufacturing step.

The stage of manufacture illustrated in Figure 1 has now been reached. In order to obtain a finished diaper from the configuration illustrated in Figure 1, all that remains is to apply a web of liquid-permeable material 4 (not shown in Figure 1) such as to form an inner casing layer of the finished article, and to secure this material web to the material web 2 in regions lying outside the bodies  $1_a-1_g$ , and attach fastener tabs 5 (not shown in Figure 1) and then cut the finished article from the composite web. The material webs are preferably joined together with the aid of glue coated on one or on both of said webs over the whole of its surface or over parts thereof.

When the article is cut from the composite web, the elastic threads 3 will contract in those parts which lie outside the bodies 1<sub>a</sub>-1<sub>g</sub>. No appreciable contraction of the elastic threads will take place in those parts of the threads which extend over the bodies 1<sub>a</sub>-1<sub>g</sub>, owing to the stiffness or rigidity of these bodies. Thus, those parts of the mutually joined, thin casing layers 2, 4 located between the bodies 1<sub>a</sub>-1<sub>g</sub> will be folded or pleated between said bodies and the side surfaces of said bodies will be moved towards one another.

As will be seen from Figure 1, the adjacent side surfaces of the bodies 1<sub>a</sub>-1<sub>g</sub> will diverge away from one another on both sides of a central transverse part which forms the crotch part of the diaper in use. This means that the bodies are forced to curve out of the plane illustrated in Figure 1 (the plane of the paper) in order for the side surfaces to be brought towards one another. It will be seen that if the side surfaces are straight, the joining line will also be straight and lie in a plane which is inclined to the original plane of the bodies. When the side surfaces are composed along their lengths from straight parts with varying directions, it will be seen that the joining line will extend in a plurality of mutually different inclined planes. It will also be seen against this background that if the side surfaces are curved between said parts of varying directions, the joining line will also be curved between its straight parts, while if the side edges are arcuate in their entirety, the joining line will also be arcuate.

Figure 2 illustrates the diaper of Figure 1 in its final state. Thus, it will be seen that a diaper whose shape corresponds to the shape of a baby's or child's bottom can be produced by appropriate configuration of the bodies or pads 1<sub>a</sub>-1<sub>g</sub> and appropriate positioning of said bodies or pads in relation to one another.

Figure 3 illustrates the same manufacturing step as that shown in Figure 1 but in connection with a second embodiment of an inventive diaper. This embodiment differs from the embodiment according to Figures 1 and 2, in that the bodies 1'<sub>a</sub>, 1'<sub>c</sub> and 1'<sub>g</sub> have been placed on top of the elastic threads 3' within the region A.

This is achieved by first placing the bodies 1'<sub>b</sub>, 1'<sub>d</sub> and 1'<sub>f</sub> onto the material web 2' and then placing the threads 3' located within the region A, which corresponds to the crotch region of a finished diaper, on top of said bodies. The remaining bodies 1'<sub>a</sub>, 1'<sub>c</sub>, 1'<sub>e</sub> and 1'<sub>g</sub> and the remainder of the elastic threads 3' are then placed in position. In other respects, the manufacture of the diaper according to this second embodiment of the invention is effected in the same manner as that described with reference to the diaper illustrated in Figures 1 and 2.

The elastic threads 3' present within the crotch part of a thus manufactured diaper will strive to bring together the upper and lower edges of the side surfaces of adjacent bodies, whereas the elastic threads 3' in remaining parts of the diaper will strive to bring together the upper sides of the side surfaces of adjacent bodies. Thus, the elastic threads in the crotch part of the diaper will strive to bring the bodies 1'<sub>b</sub>, 1'<sub>d</sub> and 1'<sub>f</sub> to a lower level than

the bodies 1'<sub>a</sub>, 1'<sub>c</sub>, 1'<sub>e</sub> and 1'<sub>g</sub>. This is made possible because the bodies located within the crotch part of the diaper can be displaced into mutually overlapping relationship when putting the diaper onto a child wearer. This affords two important advantages. The first advantage is that the bodies 1'<sub>a</sub>-1'<sub>g</sub> can be made wider in the crotch part of the diaper than would otherwise be the case, therewith increasing the strength of the diaper in the region thereof subjected to the heaviest loads in use, while the second advantage is that more absorbent material can be used in that part of the diaper where most liquid collects. Furthermore, the dispersion of liquid from the crotch part is improved with a diaper of this configuration, since more bodies or pads are active in this liquid dispersion process.

It will be understood that an elastic casing material can be used instead of elastic threads for the purpose of rendering the outwardly lying parts of the casing materials contractable. One particularly suitable material in this regard is film having a so-called elastic memory, for instance different types of Exxon Extraflex, i.e. a plastic material which can be greatly extended under plastic deformation, so that its extension will remain subsequent to removing the load but which when subsequently heated will return to its original size and therewith possess elastic properties within the region between its original size and its extended size. Shrink film or combinations of shrink film and elastic material are also conceivable for use in providing contractable parts.

It is in this respect pointed out that the elasticity of the finished diaper is primarily intended to enable the diaper to fit the bottoms of children of different sizes, and to form waist elastication.

When the invention is applied in the manufacture of three-dimensional absorbent disposable articles, there is obtained, in addition to the aforesaid good properties with respect to leakage reliability and shape conformity, which are conducive with the three-dimensional shape, the further advantage of decreasing the risk of the absorbent bodies lumping together, this advantage being conducive with the division of the absorbent body or pad into several, mutually separate bodies or pads. Furthermore, any lumping together of an inventive absorbent pad will present less of a problem than the same occurrence in a conventional absorbent pad, since the lumping together of a separate inventive pad will not influence the longitudinal dispersion of liquid in adjacent pads.

It will be understood that the illustrated embodiments can be modified in several ways within the scope of the invention, particularly with regard to the shape of the bodies and the kind of article in which the invention is applied. Furthermore, in other applications of the invention than those of the exemplifying embodiments, the separate pads can be placed closer together than in the pattern illustrated in Figure 1, in which inter-spaces between the pads must always be present in order to enable the pads to swell when absorbing liquid. It will also be understood that the invention can be solely applied in

the manufacture of the backing piece of a diaper, which is then secured to a separate front piece manufactured in a conventional manner, since the front piece of the diaper when worn will have a substantially flat form. The invention is, therefore, solely restricted to the content of the following Claims.

### Claims

1. A method for the flat manufacture of three-dimensional articles, characterized by placing a plurality of flat, flexible bodies intended to form the three-dimensional article sequentially on a flat support surface, such that the side surfaces of at least some of the mutually adjacent bodies will diverge away from one another at least in certain sections of said bodies; by mutually connecting the side surfaces of said bodies with the aid of stretched elastic members; and permitting the stretched elastic members to contract such as to convert the article from a flat state to a three-dimensional configuration.
2. A method for the flat manufacture of absorbent, disposable articles of three-dimensional configuration, characterized by placing a plurality of elongated, narrow and flexible absorbent pads ( $1_a-1_g$ ;  $1'_a-1'_g$ ) sequentially on a thin first material web of liquid-impermeable material (2; 2') or liquid-permeable material, said pads having mutually diverging side surfaces on both sides of a central part of said pads intended to form the crotch parts of a manufactured article; placing a thin, second material web of liquid-permeable material (4) or liquid-impermeable material over said bodies and fastening second material web to the first material web (2; 2') so as to enclose each pad between the two material webs; whereby those parts of the mutually joined material webs located between the different pads are biased to contract prior to or in conjunction with placing the liquid-permeable material web in position; and by then allowing the biased parts of the material webs to contract and therewith move the side surfaces of the pads towards one another.
3. A method according to Claim 2, characterized by placing the side surfaces of the elongated, narrow and flexible absorbent pads ( $1_a-1_g$ ;  $1'_a-1'_g$ ) in spaced relationship with the side surfaces of adjacent pads over the whole lengths of said pads.
4. A method according to any one of Claims 1 to 3, characterized by joining the side surfaces of the bodies ( $1_a-1_g$ ;  $1'_a-1'_g$ ) to the side surfaces of adjacent bodies with the aid of pre-stretched elastic material.
5. A method according to Claim 4, characterized in that the pre-stretched elastic material comprises film possessing an elastic memory and/or shrink film.

6. An absorbent disposable article, such as a diaper, an incontinence guard or a sanitary napkin, comprising an absorbent body enclosed between an inner and an outer casing layer, characterized in that the absorbent body is comprised of a plurality of elongated narrow bodies ( $1_a-1_g$ ;  $1'_a-1'_g$ ) of absorbent material, each of said bodies being enclosed between two casing layers (2, 4; 2') which are mutually joined at parts which lie externally of said bodies; and in that the side surfaces of said bodies are joined, or substantially joined to the side surfaces of adjacent bodies at least in those parts which lie outside the crotch region of the article; and in that the article has a three-dimensional shape.
7. An article according to Claim 6, characterized in that the casing layers (2, 4; 2') are elastic in those parts which lie between said absorbent bodies, at least in the parts which lie outside the crotch region of the article.
8. An article according to Claim 7, characterized in that the casing layers include intermediate elastic threads (3') or bands which are mounted in a stretched state and which extend transversely from one side of the article to the other on top of the absorbent bodies ( $1_a-1_g$ ) in parts of the article which lie externally of the crotch region (A) and extend alternately over and under the bodies within the crotch region (A) of said article.

### Patentansprüche

1. Verfahren zur ebenen Herstellung dreidimensionaler Artikel, gekennzeichnet durch ein Aufbringen von mehreren, ebenen, flexiblen Körpern, die dazu bestimmt sind, den dreidimensionalen Artikel zu bilden, nacheinander auf eine ebene Tragfläche und zwar so, daß die Seitenflächen wenigstens einiger einander benachbarten Körper über wenigstens bestimmte Abschnitte der Körper voneinander divergieren; durch ein wechselseitiges Verbinden der Seitenflächen dieser Körper mit Hilfe vorgespannter, zusammenziehbarer Teile; und durch ein Einräumen der Möglichkeit, daß sich die gestreckten, elastischen Teile so zusammenziehen, daß sich der Artikel von einem ebenen Zustand in eine dreidimensionale Form umwandelt.
2. Verfahren zur ebenen Herstellung von saugfähigen Wegwerfartikeln dreidimensionaler Form, gekennzeichnet durch das Anordnen von mehreren länglichen, schmalen und flexiblen, saugfähigen Kissen ( $1_a-1_g$ ;  $1'_a-1'_g$ ) aufeinanderfolgend auf eine erste, dünne Materialbahn aus flüssigkeitsundurchlässigem Material (2; 2') oder flüssigkeitsdurchlässigem Material, wobei die Kissen von divergierende Seitenflächen auf beiden Seiten eines solchen zentralen Teiles der Kissen haben, das dazu bestimmt ist,

die Schrittbereichsteile eines fertiggestellten Artikels zu bilden; Anordnen einer dünnen, zweiten Materialbahn flüssigkeitsdurchlässigen Materials (4) oder flüssigkeitsundurchlässigen Materials über den Körpern und Befestigen der zweiten Materialbahn an der ersten Materialbahn (2; 2') so, daß jedes Kissen zwischen zwei Materialbahnen angeordnet ist; wobei diejenigen Teile der miteinander verbundenen Materialbahnen, die zwischen unterschiedlichen Kissen angeordnet sind, vorgespannt sind, um sich vor oder in Verbindung mit dem Anordnen der flüssigkeitsdurchlässigen Materialbahn in ihre Stellung zusammenzuziehen; und durch ein darauffolgendes Ermöglichen, daß sich die vorgespannten Teile der Materialbahnen zusammenziehen und damit die Seitenflächen der Kissen aufeinander zu bewegen.

3. Verfahren nach Anspruch 2, gekennzeichnet durch das Anordnen der Seitenflächen der länglichen, schmalen und flexiblen saugfähigen Kissen (1<sub>a</sub>-1<sub>g</sub>; 1'<sub>a</sub>-1'<sub>g</sub>) im Abstand von den Seitenflächen benachbarter Kissen über die gesamten Längen dieser Kissen.
4. Verfahren nach einem der Ansprüche 1 bis 3, gekennzeichnet durch das Verbinden der Seitenflächen der Körper (1<sub>a</sub>-1<sub>g</sub>; 1'<sub>a</sub>-1'<sub>g</sub>) mit den Seitenflächen benachbarter Körper mit Hilfe von vorgestrecktem elastischem Material.
5. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß das vorgestreckte, elastische Material eine Folie umfaßt, die ein elastisches Gedächtnis besitzt und/oder eine Schrumpfolie.
6. Saugfähiger Wegwerfartikel, beispielsweise eine Windel, ein Inkontinenzschutz oder eine Damenbinde mit einem saugfähigen Körper, der zwischen einer inneren und einer äußeren Deckschicht eingeschlossen ist, dadurch gekennzeichnet, daß der saugfähige Körper mehrere längliche, schmale Körper (1<sub>a</sub>-1<sub>g</sub>; 1'<sub>a</sub>-1'<sub>g</sub>) aus saugfähigem Material umfaßt, wobei jeder dieser Körper zwischen zwei Deckschichten (2, 4; 2') eingeschlossen ist, die untereinander an Teilen verbunden sind, die außerhalb des Körpers liegen; und daß die Seitenflächen der Körper mit den Seitenflächen benachbarter Körper an denjenigen Teilen verbunden oder im wesentlichen verbunden sind, die außerhalb des Schrittbereichs des Artikels liegen; und daß der Artikel eine dreidimensionale Form hat.
7. Artikel nach Anspruch 6, dadurch gekennzeichnet, daß die Deckschichten (2, 4; 2') in denjenigen Teilen elastisch sind, die zwischen den absorbierenden Körpern liegen, wenigstens jedoch in denjenigen Teilen,

die außerhalb des Schrittbereichs des Artikels liegen.

8. Artikel nach Anspruch 7, dadurch gekennzeichnet, daß die Deckschichten elastische Zwischenfäden (3') oder Bänder umfassen, die in gestrecktem Zustand befestigt sind und die in denjenigen Teilen des Artikels von einer Seite des Artikels zur anderen auf der Oberseite der saugfähigen Körper (1<sub>a</sub>-1<sub>g</sub>) quer verlaufen, die außerhalb des Schrittbereichs (A) liegen und daß sie innerhalb des Schrittbereichs (A) abwechselnd über und unter den Körpern verlaufen.

#### 15 Revendications

1. Procédé de fabrication a plat d'articles tridimensionnels, caractérisé par le fait que: on place, de façon successive, une pluralité de corps plats et souples, destinés à former l'article tridimensionnel, sur une surface de support plate, de telle manière que les surfaces latérales d'au moins quelques uns des corps mutuellement adjacents divergent les unes des autres au moins dans certaines sections desdits corps; on raccorde mutuellement les surfaces latérales desdits corps à l'aide d'éléments élastiques tendus; et on permet aux éléments élastiques tendus de se contracter de manière à faire passer l'article d'un état plat à une configuration tridimensionnelle.
2. Procédé de fabrication d'articles absorbants, jetables, de configuration tridimensionnelle, caractérisé par le fait que: on place, de façon successive, une pluralité de blocs absorbants (1<sub>a</sub> - 1<sub>g</sub>; 1'<sub>a</sub> - 1'<sub>g</sub>) étroits, souples et de forme allongée, sur une première bande de matériau mince (2; 2') en un matériau imperméable aux liquides ou en un matériau perméable aux liquides, lesdits blocs ayant des surfaces latérales mutuellement divergentes sur les deux côtés d'une partie centrale desdits blocs, destinée à former les parties d'entre-cuisse d'un article manufacturé; on place une seconde bande de matériau mince (4) en un matériau perméable aux liquides au-dessus desdits corps et on fixe la seconde bande de matériau à la première bande de matériau (2; 2') de manière à enfermer chaque bloc entre les deux bandes, de matériau; grâce à quoi les parties des bandes de matériau mutuellement reliées et situées entre les différents blocs sont sollicitées de manière à se contracter avant ou en même temps que l'on met en place la bande de matériau perméable aux liquides; et on laisse les parties sollicitées des bandes de matériau se contracter et déplacer avec elles les surfaces latérales des blocs, en direction les unes des autres.
3. Procédé selon la revendications 2, caractérisé par le fait que l'on place les surfaces latérales des blocs

absorbants ( $1_a-1_g$ ;  $1'_a-1'_g$ ) souples, étroits et de forme allongée, dans une disposition espacée des surfaces latérales des blocs adjacents sur toute la longueur desdits blocs.

4. Procédé selon l'une quelconque des revendications 1 à 3, caractérisé par le fait que l'on relie les surfaces latérales des corps ( $1_a-1_g$ ;  $1'_a-1'_g$ ) aux surfaces latérales des corps adjacents à l'aide d'un matériau élastique préalablement tendu.

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5. Procédé selon la revendication 4, caractérisé en ce que le matériau élastique préalablement tendu comprend un film possédant une mémoire élastique et/ou un film rétractable.

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6. Article absorbant jetable, tel qu'une couche-culotte, une protection contre l'incontinence ou une serviette hygiénique, comprenant un corps absorbant enfermé entre une couche-enveloppe intérieure et une couche-enveloppe extérieure, caractérisé en ce que le corps absorbant est constitué par une pluralité de corps étroits ( $1_a-1_g$ ;  $1'_a-1'_g$ ) de forme allongée, en un matériau absorbant, chacun desdits corps étant enfermé entre deux couches-enveloppes (2, 4; 2') qui sont reliées mutuellement aux parties qui se trouvent à l'extérieur desdits corps; et en ce que les surfaces latérales desdits corps sont reliées, ou sensiblement reliées, aux surfaces latérales des corps adjacents au moins dans les parties qui se trouvent à l'extérieur de la région d'entre-cuisse de l'article; et en ce que l'article a une forme tridimensionnelle.

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7. Article selon la revendication 6, caractérisé en ce que les couches-enveloppes (2, 4; 2') sont élastiques dans les parties qui se trouvent entre lesdits corps absorbants, au moins dans les parties qui se trouvent à l'extérieur de la région d'entre-cuisse de l'article.

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8. Article selon la revendication 7, caractérisé en ce que les couches-enveloppes comprennent des fils ou bandes élastiques intermédiaires (3') qui sont montés dans un état tendu et qui s'étendent transversalement, depuis l'un des côtés de l'article jusqu'à l'autre côté, sur le dessus des corps absorbants ( $1'_a-1'_g$ ) dans des parties de l'article situées à l'extérieur de la région d'entre-cuisse (A) et s'étendent alternativement sur et sous les corps à l'intérieur de la région (A) d'entre-cuisse dudit article.

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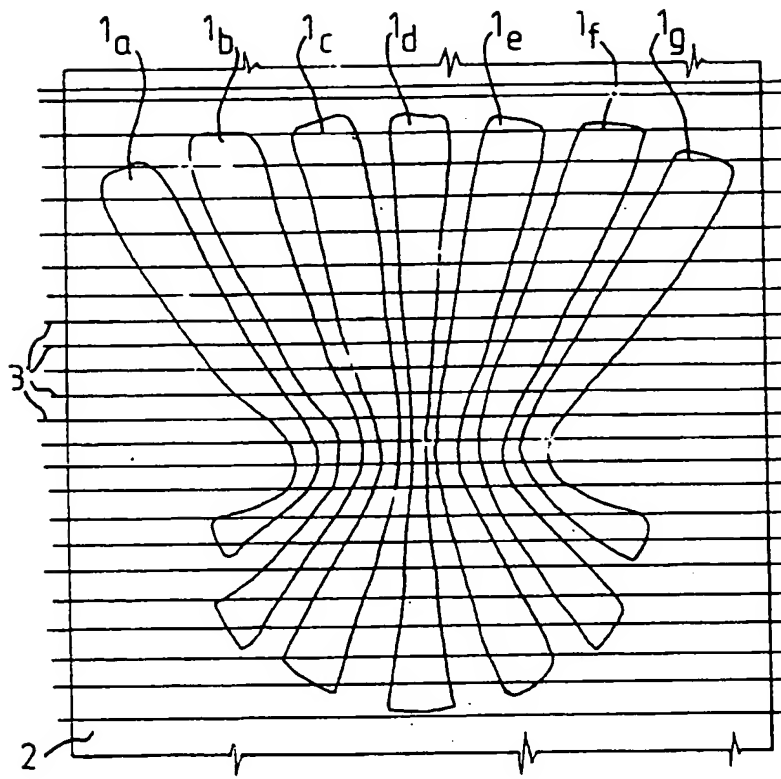


FIG. 1

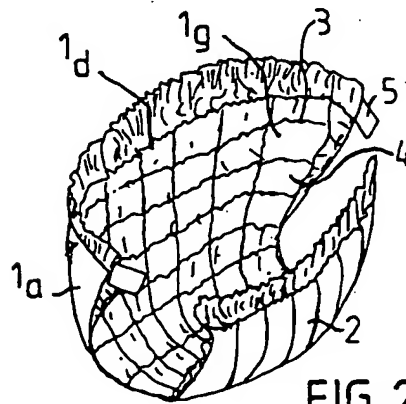


FIG. 2

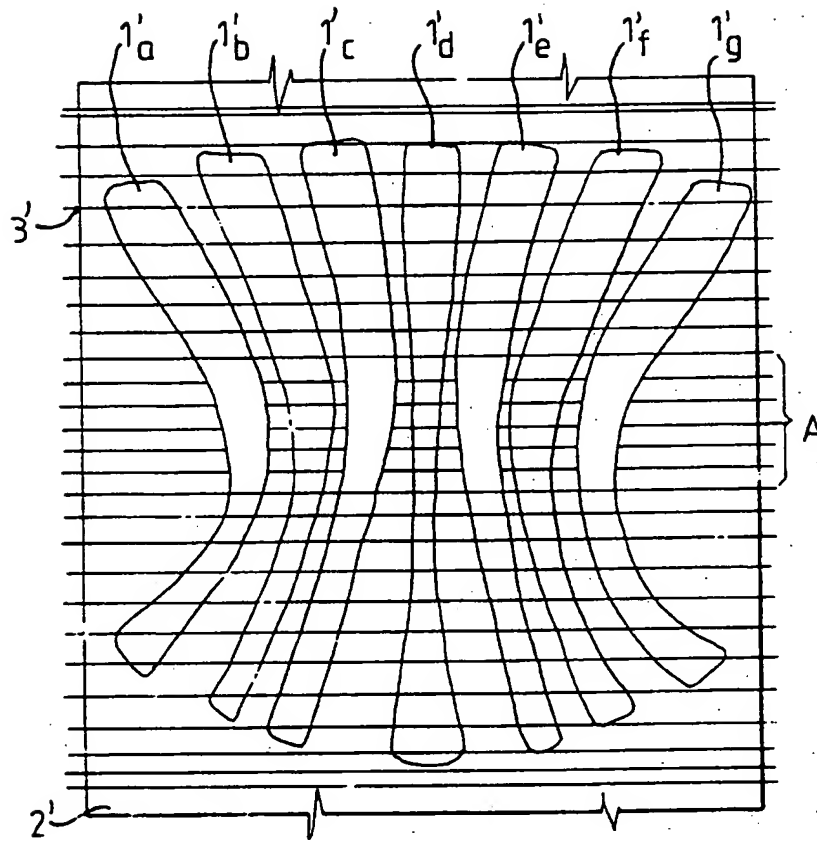


FIG. 3